

REPORT OF TWO SUCCESSFUL HIP-JOINT AMPU-
TATIONS, THE SECOND OF WHICH WAS
PERFORMED BY A NEW METHOD.

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CASE I.—*Small Round-Cell Sarcoma of the Left Biceps Femoris.*
—*Amputation at the hip through a Furneaux Jordan incision.*
Recovery.

W. J. B., aged twenty-two years, United States, printer, was admitted to the Presbyterian Hospital December 4, 1894. When ten years old fell on stairs, injuring his left knee, the outer part of which was subsequently tender when struck, but not until four years later was a slight swelling noticed on the outer and posterior aspect of the joint. This continued to increase very gradually in size until three months ago, when the growth became rapid.

Examination shows a tumor on the outer and posterior aspect of the knee, not involving the joint, five inches long by four and three-quarters wide; it is somewhat lobulated, seems fluctuating, but not pulsatile. It prevents full extension of the knee. It is painless. Aspiration yields only bloody fluid. For diagnostic purposes, on December 10, an incision was made; the tumor on its surface showed infiltrated subcutaneous fat, pinkish in color. Bloody fluid mixed with masses of grayish semi-gelatinous material, to the amount of a pint, was evacuated. The walls of the cavity bled freely, and their friability prevented the use of a ligature. The cavity was curetted and packed tightly with sterilized gauze.

Pathologist's report showed the tumor to be a small round-cell sarcoma. For the succeeding five days the patient felt the effects of the operation, his temperature reaching 103° F.

December 18. Operation; ether. Patient's pelvis was brought to the end of the table, a low sand-bag was placed under the left buttock. Esmarch's bandage was not used through fear of disseminating sarcomatous elements, but the limb was held nearly perpen-



dicular for a few minutes before piercing the thigh with new $\frac{3}{16}$ -inch mattrass needles, and applying above them the rubber tubing, after the adaptation of Wyeth. Just as the tubing was secured the outer pin began to bend and the tubing settled upon the trochanter major. It was necessary to remove the tubing, reinforce the bent pin by a fresh one, traversing the same puncture along its side, and reapply the tubing.

Standing between the thighs, both of which were supported by assistants, a seven-inch vertical incision was begun as high above the great trochanter as the encroachment of the tubing upon the region would permit. Through this longitudinal opening as complete as possible a separation of all the muscular attachments surrounding the joint was made, and the capsule divided on its outer and anterior surface. At the extremity of the longitudinal a nearly circular incision was made through the skin and a cuff of two inches laid back, when the external groups of muscles were divided to the bone, a blunt dissection stripped them from the shaft of the femur, and the inner group of muscles containing the vessels was divided last. Nothing now remained but to incise the capsular ligament more completely, and by my assistants' skilful manipulation of the leg and knee the head of the femur was rotated outward and the round ligament severed.

The femoral artery was ligated with silk, the other vessels with catgut. The sciatic nerve was cut back. A few deep retention sutures were placed. The wound was closed without drainage by interrupted silk-worm-gut sutures, supplemented by a continuous suture of fine black silk. Iodoform gauze, cotton, and firm bandaging completed the dressing.

The operation proper occupied twenty-five minutes, and the patient left the table in good condition, without stimulation.

For a few days some constitutional reaction and elevation of temperature occurred, but these symptoms were not so marked as those following the preliminary operation.

December 27, nine days later, the first dressing was made. Primary union throughout. Interrupted sutures removed.

January 1, patient sat up. January 2, second dressing, all sutures removed. January 9, third dressing. January 16, photograph taken (Figs. 1 and 2). January 17, discharged.

The pathologico-anatomical report stated round-cell sarcoma, wholly confined to the outer or short head of the biceps flexor cruris, which had been much distended by the disease.

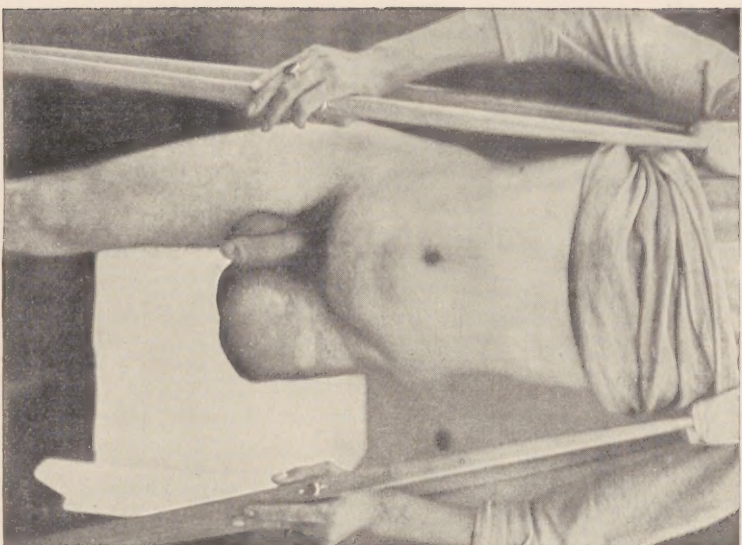


FIG. 1.—Amputation at the hip-joint through a Furneaux Jordan incision.



FIG. 2.—Stump of hip-joint amputation at the end of four weeks after operation.

The hæmostatic effect of the rubber tubing, supported by transfixion needles, was all that could be desired, the proximal face of the wound being relatively dry. But an objection to the method was noticed in that the skin and muscles about the joint were made so tense and hard by the compression of the tubing that the region was much more inaccessible to instruments and fingers than would have been the case if this constriction had not existed. And even after disarticulation the margin of the cotyloid cavity was difficult to trim up for the same reason.

Apparently recognizing this fault, McCurdy uses only the inner pin for figure-of-eight elastic loop, and Lanphear practises a higher point of insertion for the outer pin, one which Dr. Wyeth, in a recent article,¹ now proposes to adopt, so that the rubber tubing will be held "in the notch just below the anterior superior spine of the ilium."

Having a strong and expert assistant to manipulate the leg as indicated, it appears to me advantageous not to saw the femur just before disarticulation, but to save time and gain power by retaining the leverage of the entire limb.

CASE II.—*Tubercular Osteo-Arthritis of the Hip; Amputation at the Hip Joint by a New Method through an Antero-External Incision.*

—T. D., aged 27 years, female, married, United States, was admitted to the Presbyterian Hospital, June 21, 1895, suffering from tuberculosis of the hip-joint of the third degree.

About two years previous she began to have pain in the left hip and knee when walking. She took to bed in October, 1893, and remained so confined for five months. On getting up, patient was much bent; she could not stand straight or walk; the left leg was contracted,—only the toes could touch the ground; the left knee was increased in size. An abscess near the trochanter became a sinus, discharging intermittingly for months. Later two similar sinuses formed above and behind the knee. She has lost much weight in past two years.

On admission, temperature 102.4° F., pulse 138, respiration 36; urine negative.

Physical examination revealed signs of some pleurisy at the base

¹ How to Amputate. New York Medical Journal, November 16, 1895.

of right lung. Subsequent examination showed tubercle-bacilli in the scanty sputum.

The left leg was three-quarters of an inch shorter than the right; thigh and calf each three-quarters of an inch less in circumference than the right; foot slightly inverted. Palpation about the hip showed a boggy fulness and elicited pain. There was a discharging sinus behind and below the great trochanter leading towards, but not into, the joint. Two discharging sinuses opened above the popliteal space, being superficial and leading upward. The slightest movement of her leg caused great pain, ascribed mostly to the knee.

For three weeks subsequent to admission her condition remained unchanged. She had a daily rise of temperature to 103° F. or more. She suffered great pain with every slight movement. Efforts to immobilize the limb were futile. She begged for any operative interference. Dr. Briddon saw the patient and endorsed my proposal to excise if the conditions justified it; otherwise, to amputate at once.

July 11, 1895. An incision was begun half an inch below the anterior superior spinous process of the ileum, and prolonged downward in the intermuscular septum between the sartorius and rectus on the inner side and tensor vaginæ femoris and glutei on the outer. This afforded, with scarcely any bleeding, excellent access to the capsular ligament and the tissues immediately surrounding it, where a cavity containing considerable tubercular *débris* was rapidly cleared out with a Barker flushing gouge, which delivered sterilized salt solution at 110° F. under a good gravity pressure. On opening into the capsule, advanced tubercular disease was found; the parts here were similarly cleansed with the flushing curette and examined.

The conditions of disease presented by the joint and surrounding muscles, combined with the extreme debility of the patient and her age, were not considered favorable for excision.

Preparation for amputation consisted in a brief massage of the leg and thigh while held perpendicularly. At the same time one jaw of a specially made clamp was passed through the existing incision, guided by the finger, under the sartorius and under the femoral vessels close to Poupart's ligament, the other jaw being outside the wound and bearing upon the cutaneous surface overlying the vessels. As the clamp was moderately tightened and the limb lowered, pulsation of the femoral below the clamp could not be felt by the finger in the wound. The handle of the clamp rested upon the abdomen, where it lay parallel with the flare of the pelvic brim.

The application of the clamp to the vessels was a simpler matter than I had anticipated. It required but a moment or two to force the finger under the sartorius and under the sheath of the vessels as they lay upon the psoas, and through this short space, along the upper side of the finger, was slipped one blade of the clamp, the tip of which was sheathed with rubber tubing, a possibly unnecessary precaution against injury to the vessels.

It was presumed that the anterior crural nerve would lie just to the outer side of the clamp compression and in the same fenestrum of the instrument as that surrounding the sartorius.

The patient's pelvis was now brought to the end of the table. The left leg was supported by an assistant, while the right thigh was flexed upon the pelvis and secured to the abdomen and table.

The existing incision was extended along the outer border of the rectus downward to the bone, and through this deep incision the remaining attachments to the joint and femur were mainly stripped off. A circular skin-cuff was cut and turned back. The femoral clamp was tightened one point before severing the muscles with a circular incision to the bone. Some of the small branches of the sciatic system required the application of pressure forceps, but the femoral vessels and their branches were absolutely dry on the proximal side.

It remained only to turn downward and backward the divided muscular cuff, raise through it the thigh, and sever the posterior part of the capsular ligament, when the head of the bone was turned outward by my assistant and the round ligament cut. The femoral artery was ligated with silk, all outer vessels with catgut. Gradual loosening of the femoral clamp by stages permitted an excellent opportunity of seizing the bleeding points in regular order of their importance, and the clamp afforded a simple method of quickly opening or closing the blood-current in the main channel.

The rather extensive muscular portions concerned in the abscesses and sinuses had been cut away with scissors before ligation of the vessels. The diseased portion of the acetabulum was curetted, and the wound-flaps united by interrupted silkworm-gut, then more accurately adjusted with a continuous suture of fine black silk. Drainage by iodoform gauze was provided for at the uppermost part of the wound, and through the large sinus formerly behind the trochanter. The expediency of this drainage, I think, was questionable.

As all preparation had been made to utilize saline venous infusion

at some time during the operation,¹ one and a half litres were now thrown into the median cephalic vein by Dr. Hartwell while the wound was being sutured. The beneficial effect of this infusion was at once manifest, and the patient left the table with a fuller and slower pulse than she had had since admission to the hospital.

On the night of the operation her temperature was 103.6° F., pulse 136. From that time until noon of the day following a gradual decline of temperature and pulse occurred, reaching: temperature 96.6° F., pulse 100, respiration 24. The same afternoon the temperature was 99.5° F. For six days her temperature was not above 101° F.; then pulmonary symptoms became gradually more noticeable, and before being discharged she again, on a few occasions, had pyrexia reaching 103° F.

July 14. Four days after operation first dressing. Union was excellent along the whole extent of sutures. Over the femoral vessels there was no mark or discoloration to suggest that any clamp pressure had been sustained at that point. The drainage gauze was removed and a smaller strip of the same kind introduced. The ready access to the line of sutures, occupying, as it did, the entire anterior face of the stump, made it a comfortable one to inspect for both patient and surgeon. Subsequently, dressings were made at four-day intervals until she was discharged to go into the country, on August 18, five weeks after operation. (Fig. 3.)

Although still a victim of pulmonary tuberculosis, her happiness in being relieved of the painful hip-affection justified the risk she had assumed.

As soon as I consented to operate at all upon this patient, I began to anticipate that the incision for excision would probably reveal a state of affairs requiring amputation, and with this in mind I felt the need of some hæmostatic device which would permit one operation to merge into another without the loss of valuable time. As it was possible that a deep-seated psoas abscess existed about the joint without invading it, an immediate hip amputation without exploration would be illegitimate. An exploratory incision, then, must first be made, and the best one for this particular case was that of Hueter and Parker,² between

¹ McBurney, *ANNALS OF SURGERY*, August, 1894.

² *Clinical Society Transactions*, Vol. XIII.



FIG. 3.—Amputation at the hip-joint through an antero-external incision. The transverse dark line is a cutaneous fold caused by the bandaging.



FIG. 4.—To show the antero-external incision with its relation to the upper extremity of the femur and to the femoral clamp.

the muscles having origin at the anterior superior spinous process. When through this incision the conditions requiring amputation were revealed, what form of tourniquet or arterial compression should be utilized before proceeding? In answering this query, I could think of none which would not take considerable time to apply or else be illy adapted to the particular incision already made to expose the joint. The only ready resort appeared to be digital compression exerted by an assistant standing at the patient's side and facing the operator, who should slip his index-finger under the sartorius and the femoral vessels, while his thumb rested upon the cutaneous surface. This idea was the origin of the clamp, the steel jaws of which could be relied upon not to tire, and it was believed that if the finger could effect an easy access to a point under the vessels below Poupart's ligament that the clamp could as easily follow the finger's lead.

From my satisfactory experience with this method of amputation at the hip-joint, although only in a single case, I feel justified in advocating it, and desire to formulate its claim for merit on the following points:

(1) The incision is one which permits the best exposure of the joint through tissues which contain no vessels or nerves of any importance, and the same incision serves for the easy adjustment of a clamp upon the femoral vessels before advancing to the critical stages of the operation.

(2) The angled shape of the clamp is such that while it securely compresses only the femoral artery and vein between their sheath and the overlying skin, it serves at the same time as an inward retractor for the sartorius muscle, and the instrument is wholly out of the operative field during all its stages. Esmarch's bandage may be applied up to the ischium, and yet space remains for the incision through which the clamp can be inserted.

(3) The continuation of the incision along the outer border of the rectus and down to the bone is one containing a minority of the arterial branches of the sciatic, and furnishes a wound which is directly before the operator, and through which, after

the circular severance of the muscles, the femur can be vertically raised to expose the posterior attachments about the joint and the corresponding part of the capsular ligament.

(4) Because of the antero-external position of the incision, both the open wound and its final suture are most accessible to the operator. The same advantage applies to subsequent inspection and dressing of the stump, as well as the remote chance of urinary or fæcal contamination of the line of suture.

5) The belief that this operation, including the period of anæsthesia, can be performed in a shorter time than any of those where the danger from hæmorrhage is as thoroughly guarded against.

The incision originated nearly simultaneously by Hueter and Parker, in 1878, has had its manifest advantages admirably expounded by Barker,¹ as the ideal one for hip-joint excision, but I have not seen it mentioned as a selective one for hip-joint amputation, and this probably only because it has not hitherto had associated with it any simple hæmostatic adaptation. Certainly, all the methods of amputation which depend upon elastic compression or a tourniquet, which encroaches upon the region just below the anterior superior iliac spine, would necessarily preclude its use.

If I had occasion to do another hip-joint amputation, I would wish again to utilize the incision here recommended; and if I were deprived of the services of the clamp, I would employ digital compression of the femoral vessels immediately below Poupert's ligament, the forefinger being passed through the upper angle of the incision and under the sartorius muscle to beneath the common sheath of the artery and vein.

I see no reason why an incision commencing at the same place, but there deepened only sufficiently to pass under the sartorius, should not then be continued in length and depth along the outer border of the rectus for the performance of a trochanteric or high amputation of the thigh. The method would have the advantages of celerity and excellent retraction of the soft parts for sawing the bone.

¹ British Medical Journal, January 19, 1889.

As a retrospect to this method of hip-joint amputation, I can foresee no possible criticism of the incision advocated; while to the use of the clamp I can anticipate only two objections:

(1) That those branches of the internal iliac, the gluteal, and sciatic, supplying muscles on the posterior part of the thigh are exempt from control until cut; and

(2) That some injury to the femoral vessels may follow their compression by the clamp.

In the majority of cases I believe the former objection can be disregarded, for it is exceptional to be obliged to make so short a posterior flap as to invade the bodies of the gluteal muscles, where the vessels of this group are of some size. As to their only moderate branches encountered by the above incision, catching them when cut with artery forceps is quite a sufficient precaution. The same holds good of the sciatic artery and its branches. In the exceptional cases just alluded to the accurate hæmostatic method of McBurney¹ is unquestionably the best,—namely, that of digital compression of the common iliac through an abdominal incision. But in other cases the complete retraction of the muscular flaps permitted by the femoral clamp makes application of the artery forceps to these small posterior vessels particularly easy.

The second objection can be dismissed when we realize how slight a degree of direct compression is necessary to occlude even so large a vessel as the common femoral, for the blood-tension is not greater than the pressure of a column of water six feet high.

In order to test the sensitiveness of the living tissues to a degree of compression necessary to prevent any leakage from a column of water of twice this pressure, I placed a rubber tube coming from a fountain syringe along the surface of the little finger, and included finger and tube in the clamp for half an hour without any marked discomfort.

The occlusion was so complete and the discomfort so slight that I believe this clamp method would be an improvement on the practice once much in vogue for the cure of femoral and

¹ ANNALS OF SURGERY, August, 1894.

popliteal aneurism,—namely, instrumental or digital compression of the vessels against the pubic bone. The facts that by the clamp the crural nerve could wholly escape compression and the vein suffer only a slight diminution of its calibre appeal in its favor. The wound made for the clamp insertion is an immediate disadvantage, but by aseptic precaution it should amount to nothing more than does this same practice, which, in place of ligation, is not infrequently resorted to now for forty-eight hours or more.

The original clamp made for me by Messrs. Stohlmann and Pfarre is the exact counterpart of this, except that in the latter I have had the serrated spring lock made reversible to fit either handle, consequently the instrument is equally convenient for both right and left hips. The projection of the spring catch should point upward from the abdomen.

The jaws of the clamp (Fig. 5) are at an angle of 130 degrees with the handles. The points of the jaws are a scant three-quarters of an inch long. The fenestrum (for straddling the sartorius) is a little more than one and a half inches in length. The points of the jaws are smooth and flat on their opposing surfaces, and just parallel when one-tenth of an inch apart.

The only advantage in capping these points, when in use, with rubber tubing is that the entire instrument may be steadied by a firmer hold upon moist tissues with a minimum amount of pressure.

Fig. 4 shows the relationship of the antero-external intermuscular incision to the hip-joint and to the femoral clamp.

Fig. 6 shows the relationship of the clamp's fenestrum to the sartorius muscle and the jaws of the instrument to the femoral vessels close to Poupart's ligament. In the illustration will be also noted the inward retraction of the sartorius, as is shown by the muscle itself, as well as by the reduced size of Scarpa's triangle. By this retraction the advantageous exposure of the insertions of the rectus muscle and of the capsular ligament is apparent.

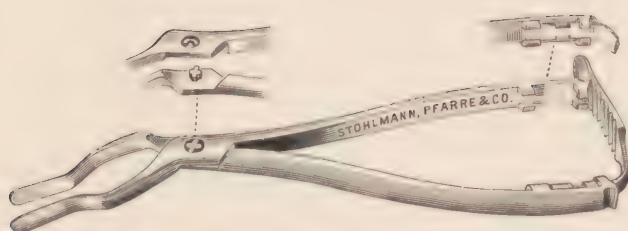


FIG. 5.—Femoral clamp.



FIG. 6.—Showing application of clamp to the femoral vessels.

1. Poupart's ligament, femoral vessels below it grasped by the clamp.
2. Sartorius straddled and retracted by the clamp.
3. Hip-joint well exposed by inward retraction of sartorius.
4. Origin of sartorius at the anterior superior spinous process.
5. Symphysis.

